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TEACHING WORD RECOGNITION TO DISADVANTAGED BOYS WITH VARIATIONS IN AUDITORY AND VISUAL PERCEPTUAL ABILITIES[1]

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Abstract

This study presents results from an experiment designed to assess whether the employment of teaching approaches consistent with the auditory or visual perceptual strengths of disadvantaged boys would facilitate their ability to learn and retain a list of unknown words. Two groups of 20 pupils were identified from a sample of 105 subjects. One group demonstrated visual strengths and auditory weaknesses, while the other group possessed the opposite perceptual pattern. Subjects were then taught to recognize 15 words by a visual or sight-word teaching emphasis and another set of 15 words by an auditory or phonic teaching emphasis. The results failed to support the predicted interaction between perceptual aptitudes and approaches to teaching word recognition. Findings revealed, however, a trend toward more efficient learning under the visual teaching method. The results are related to other recent studies which suggest that disadvantaged children may learn more efficiently under a visual presentation of verbal material.

Teaching Word Recognition to Disadvantaged Boys with Variations in Auditory and Visual Perceptual Abilities[1]

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Many children encounter great difficulty in acquiring reading skills under prevailing methods of teaching reading. Surveys of large school populations indicate that the prevalence of children with reading difficulty ranges between 10 and 30 per cent (Austin, Bush & Huebner, 1961; Harris, 1961; Malmquist, 1958). The problem of reading retardation among disadvantaged children is particularly acute. Reading failure among children of lower socio-economic status runs from four to ten times the rate reported for the rest of the school population (Chandler, 1966; Deutsch, 1966; Shepard, 1962). Deutsch (1965) has coined the term "cumulative deficit" to describe the tendency of disadvantaged children to fall increasingly behind in academic subjects with each successive grade level.

Attempts to identify the factors related to early reading failure have been numerous (cf. Johnson, 1967). Among the most persistently mentioned causes of reading problems are deficiencies in auditory and visual perceptual skills. Numerous studies report significant correlations between these skills and measures of reading in the primary grades (Buktenica, 1966; Chall, 1963; Durrell, 1953; Dykstra, 1966; Goins, 1958; Mulder, 1955; Schellenberg, 1963).

On measures of auditory perception, the evidence indicates also that poor readers are inferior to good readers in auditory discrimination (Bond, 1935; Christine, 1964: Goetzinger, 1960; Monroe, 1933), auditory sound blending (Kass, 1966) and auditory memory (Graham, 1952; Hirst, 1960; Neville, 1961). Poor readers have been found inferior to good readers, moreover, on tests of visual discrimination (Kass, 1966; Malmquist, 1958), visual memory (Kass, 1966; Rizzo, 1939), perceiving embedded figures (Elkind, 1965; Stuart, 1967), visual closure (Kass, 1966), visual-motor memory (Leton, 1962; Walters, 1961), as well as on tasks requiring the cross-modal matching of auditory and visual stimuli (Birch & Belmont, 1964).

Poor reading skills among children from educationally disadvantaged backgrounds may develop as a consequence of specific deficiencies in auditory and visual perception. In comparison to more advantaged peers, children of low socioeconomic status rank lower in a variety of auditory and visual perceptual skills (Buktenica, 1966; Clark & Richards, 1966; Corington, 1964; Deutsch, 1964; McConnell & Robertson, 1967; Templin, 1957). Since the evidence consistently reveals high prevalence of both perceptual and reading problems among the disadvantaged, their difficulty in learning to read may develop from pronounced deficits in one or both of the critical sensory modes requisite to the normal acquisition of language skills.

Teaching methods which ignore the perceptual strengths or deficits of disadvantaged children are likely to magnify the difficulty they encounter in attempting to develop skills in reading.

Yet the relationship of perceptual aptitudes to varying methods of teaching has been largely ignored in investigations of early reading instruction. In related studies, Bond (1935) and Fendrick (1935) studies the auditory and visual characteristics of good and poor readers in the second and third grades of four schools. A sight-word method was used to teach reading in three of the schools, while the fourth employed a program with a systematic phonic emphasis. Bond (1935) found that the differences obtained between reading groups on auditory measures were greatest under the instructional program in which the children had been taught principally through a phonic approach. Conversely, Fendrick (1935) found that differences between good and poor readers on two visual perception tests (total of nine) were more predominant under the "look-and-say" method. Fendrick concluded that the "sensory differences were probably a function of the teaching method employed" (p. 51).

In post hoc analyses, de Hirsch, Jansky, and Langford (1966) used a number of tests to identify seven pupils with auditory strengths and three with visual strengths from a sample of 53 subjects. The three visual strength pupils were considered superior readers; five of the auditory strength pupils were rated as good readers, while two of them failed a comprehensive battery of reading tests. Further investigation of the auditory strength pupils revealed that successful readers learned to read with a phonics system, while the two reading failures had been taught by an approach employing visual or sight-word emphasis. The results led the authors to conclude that "exploration of modality strength and weakness is of

more than theoretical interest and should largely determine teaching methods" (p. 82).

A few studies have employed a prospective design to evaluate the effects of teaching early reading skills to children with varying perceptual aptitudes. Bateman (1967) tested the efficacy of phonic vs. "look-and-say" methods of teaching reading to first-grade children grouped by learning modality (auditory or visual). Pupils were classified as auditory or visual learners on the basis of memory scores obtained on the two automatic-sequential subtests of the Illinois Test of Psycholinguistic Abilities. Visual and auditory strength children were then placed into separate classrooms, and taught to read by a phonic or sight-word method of instruction which was consistent either with their perceptual strength or weakness. The phonic approach was the Lippincott basal reading program; the "look-and-say" classes used the Scott, Foresman basal reading series. At the end of the first grade, the results showed the phonic method pupils significantly superior on reading achievement, regardless of the preferred perceptual modality.

Robinson (1968) contrasted a basal reading program and the Hay-Wingo phonic approach for pupils with different auditory and visual perceptual aptitudes. Two school systems were represented under each teaching approach. The basal reading approach was taught to 232 pupils, while 216 subjects participated in the supplemental Hay-Wingo program. The following groups were constituted within each condition on the basis of visual and auditory perception

tests: (1) high visual-high auditory, (2) high visual-low auditory, (3) low visual-high auditory and (4) low visual-low auditory. The groups were contrasted on reading achievement at the end of the third grade. In general, the results failed to reveal any significant interaction between perceptual abilities and methods of teaching.

Harris (1965) compared the effectiveness of kinesthetic and phonic instruction upon the reading achievement of first grade children, low in visual perception skills. Two visual perception tests, a test of rhyming from the Gates Reading Readiness Test, and the Bender Visual-Motor Gestalt Test were administered to a group of kindergarten children. Four groups were established from the test scores: (1) kinesthetic experimental (low visual perception, higher Bender); (2) kinesthetic control (low visual perception, low Bender); (3) phonic experimental (low visual perception, higher rhyming); and (4) phonic control (low visual perception, low rhyming). Each group contained four to seven subjects (IQs > 113). The teachers administered prescribed teaching lessons to each subject during periodic individualized reading conferences. The results were analyzed by measuring the disparity between obtained and predicted achievement grade, based on a regression equation between the visual perception and reading test scores. At the end of the first grade, no evidence was obtained to indicate that subjects responded to reading instruction according to pretest perceptual aptitudes.

Unfortunately, the studies of Bateman, Harris, and Robinson were subject to most of the following methodological limitations:

(1) The number of measures used to classify subjects according

to perceptual dominance were quite limited, probably resulting in the establishment of groups with inconsequential differences in basic auditory and visual perceptual skills.

(2) Most of the subjects were average or above average in verbal intelligence. Since most children of at least average intelligence ordinarily develop adequate reading skills regardless of the particular approach employed, perceptual aptitudes would be expected to be less predictive of success in learning to read under varying instructional methods.

(3) Teaching procedures and the influence of teacher effectiveness were not controlled systematically. Harris (1965), for example, observed the presence of considerable variation among teachers in the procedures they used to implement the two methods. Control for differential teacher effectiveness in comparative reading method studies is crucial, since recent evidence indicates that the teacher may be more influential than the method in the development of reading skills (Bond & Dykstra, 1967; Dunn & Bruininks, 1968).

(4) Teaching approaches did not differ enough in instructional emphasis to test adequately the relationship of matching teaching methods to the perceptual characteristics of children.

(5) Most of the studies evaluated the efficacy of matching

reading approaches to perceptual aptitudes at the completion of the first grade. At the end of the first grade, any initial advantage accruing from this approach to reading instruction may have been obscured.

Evidence from studies of perception and early reading performance suggests that matching teaching procedures to the perceptual aptitudes may improve learning. In order to adequately assess the efficacy of this approach, however, it would be necessary to alter the methodological approaches employed in past research studies. Taking into account the above mentioned methodological problems, the present study employed: (1) a comprehensive battery of tests to identify subjects with differing auditory or visual perceptual abilities, (2) a sample comprised of educationally disadvantaged boys (a group with a propensity to develop significant perceptual and reading difficulties), and (3) teaching procedures in which the subjects were taught to recognize lists of unknown words under controlled conditions. It was predicted that providing reading approaches consistent with the auditory or visual perceptual strengths of disadvantaged boys would improve their recognition and retention of a list of unknown words.

Method

Perception Measures

Each subject was administered a comprehensive battery of six auditory and six visual perception tests. On the basis of research and theory in the area of early reading instruction, tests were selected which measured auditory and visual perceptual abilities

considered important to the development of early reading skills. Moreover, an attempt was made to match the tests across modalities so that they measured the same or similar perceptual attributes (cf. Table 1). The tests were administered to each subject in the order they are discussed below.

Visual-Motor Sequencing. Visual-Motor Sequencing is one of nine subtests from the Illinois Test of Psycholinguistic Abilities (McCarthy & Kirk, 1961). The test assesses the subject's ability to reproduce a sequence of visual stimuli from memory.

Perceptual Speed. Perceptual Speed is one of five subtests from the Primary Mental Abilities Test, Grades 2-4 (Thurstone & Thurstone, 1963). It measures the rapid visual recognition of likenesses and differences between objects and symbols.

Auditory Attention Span for Related Syllables. Auditory Attention Span for Related Syllables is a subtest of the Detroit Tests of Learning Aptitude (Baker & Leland, 1967). The test measures short-term auditory memory for sentences.

Visual Automatic. Visual Automatic (Kass, 1962) is a measure of visual perceptual closure. It consists of a series of 18 items depicting pictures of animals or common objects. The pictures for each item are sequenced on four separate cards, with each card displaying progressively more detail. The subject's score on each item is determined by how quickly he can name the completed object.

Memory-for-Designs. Memory-for-Designs (Graham & Kendall, 1960) measures visual-motor memory. The test requires the subject to draw from memory 15 simple geometric designs, printed on small

Table 1

Tests Measuring Perceptual Components of Early Reading

Perceptual Abilities Measured	Names of Tests	
	Visual	Auditory
1. Fine discrimination of likenesses and differences.	1. Perceptual Speed (Primary Mental Abilities Test)	1. Wepman Auditory Discrimination Test (signal only)
2. Perception of figure from ground; freedom from distraction.	2. Children's Embedded Figures Test	2. Wepman Auditory Discrimination Test (signal plus noise)
3. Sequential memory for discrete units.	3. Visual Motor Sequencing (Illinois Test of Psycholinguistic Abilities)	3. Digit Span (Wechsler Intelligence Scale for Children)
4. (a) Blending--ability to synthesize discrete units into a perceptual gestalt; or (b) Closure--ability to predict a whole from a part.	4. Visual Automatic	4. Roswell-Chall Auditory Blending Test
5. Ability to retain a perceptual gestalt (whole), or meaningful material	5. Memory-For-Designs	5. Auditory Attention Span for Related Syllables (Detroit Tests of Learning Aptitude)
6. Ability to match auditory or visual temporal stimuli with visual stimuli arranged spatially.	6. Visual Integration Test	6. Auditory Integration Test

cards in black ink, after an exposure period of five seconds. Test protocols were evaluated independently by two qualified examiners.

Children's Embedded Figures Test. The Children's Embedded Figures Test (Karp & Kornstadt, 1963) measures the ability involved in perceiving a simple geometric figure embedded in a complex one.

Digit Span. Digit Span (Wechsler, 1949) is an auditory measure of short-term memory of digits presented sequentially; the test consists of two forms: Digits Forward and Digits Backward.

Wepman Auditory Discrimination Test. The Wepman Auditory Discrimination Test is designed to measure the ability to distinguish between the fine differences that exist among the phonemes used in English speech (Wepman, 1958). The test includes two alternate forms which each contain 40 word-pairs (e.g., tub-tug), 30 of which differ only in a single phoneme, 10 of which are identical. The subject is required to indicate whether the words of each pair are the "same" or "different".

Each subject received the two alternate test forms on a Wollensak Model T-1500 Tape Recorder--one under a "signal only" condition, and the other under a "signal plus noise" condition. The "signal plus noise" condition was administered to assess the subject's ability to discriminate between speech sounds in the presence of distracting background noise similar to the ambient noise levels in most elementary school classrooms. The background noise consisted of voices recorded in a college cafeteria. Certain

high frequncy peaks were removed to insure that the background noise was unintelligible. The intensity of the test words exceeded the noise level by nine decibels--a signal-to-noise ratio which is slightly higher than the dividing point between satisfactory and unsatisfactory communication (Licklider & Miller, 1951).

Roswell-Chall Auditory Blending Test. The Rosewall-Chall Auditory Blending Test (Roswall & Chall, 1963) assesses the ability to synthesize separate speech sounds into whole words. It consists of 30 common words; the child is instructed to blend the individual phonemes into whole words (e.g., s-i-t = sit).

Perceptual Integration Tests. The Perceptual Integration Tests measure the ability to match a temporal code received via the sense modalities of audition or vision with a visually and spatially arranged dot pattern. Auditory and Visual Integration tests developed by Sterritt and Rudnick (1966) were used to measure these skills. On the Auditory Integration Test, temporal code patterns consisted of 1000 H_z pure tones presented at 70 decibels sound pressure level. In the Visual Integration Test, the temporal patterns were presented in the form of light flashes. Following the presentation of a temporal code, the subject was instructed to choose a configuration from three sets of visual-spatial dot sequences which looked like the pattern that had just been presented. Each test was preceded by detailed instructions and six practice exercises.

Subjects

The total subject pool consisted of 105 Negro boys, with a mean Stanford-Binet IQ of 90 (s = 10.25) and a range of 70 to 110.

All subjects were reported to have possessed adequate auditory and visual acuity, according to Head Start medical examinations, school records, or teacher reports. Of the 105 subjects, 95 were enrolled in the third grade, while the 10 remaining subjects had been retained the previous year in the second grade. The subjects had a mean chronological age of eight years, seven months, and a mean grade equivalent score of 2.74 ($\underline{s}$ = .82) on the three reading subtests of the Metropolitan Achievement Tests, Elementary Battery.

The sample was selected from among 32 classrooms in eight schools of the Public Schools of Metropolitan Nashville-Davidson County, Tennessee. According to indices of socioeconomic status and ratings by school personnel, most of the subjects were considered to be economically disadvantaged. Socioeconomic status ratings indicated that 75.8 per cent of the families lived in fair to extremely poor housing; the mean self-reported educational level of the better educated parent was 11.3 grades; the average number of persons per family was 6.8; and 79.1 per cent reported incomes below $5,999.

Auditory and visual perceptual dominance groups were established by administering to each subject the perceptual tests described above. The tests were administered by female psychometricians trained by the investigator. To identify subjects with auditory or visual perceptual strengths, the raw scores of each test were converted into standard scores. Negative scores were eliminated by applying a linear transformation to each standard score, using a mean of 50 and standard deviation of 10. The sum of standard

scores for the auditory tests was subtracted from the sum of standard scores for the visual tests (i.e., V-A). Subjects whose V-A scores were in the upper 25% of the distribution were designated visually dominant, while those whose differences were in the lower 25% were classified auditorily dominant. Following this procedure, groups were established which had either strengths in visual perception and weakness in auditory perception, or strengths in auditory perception and weaknesses in visual perception. The original dominance groups each contained 26 subjects. Six auditorily and two visually dominant subjects were eliminated from the study because they failed to miss the required number of words to administer the learning task (minimum of 30 words). A further deletion of subjects was made in the visual dominance group in order to satisfy the proportion criterion for the analysis of variance. The final sample size in each group was 20 subjects. In comparison to the total sample, perceptual dominance subjects were rated slightly lower on the socioeconomic status indices of educational level of the better educated parent (10.9 vs. 11.3) and proportion with incomes below $5,999 (87% vs. 79%), as well as on mean IQ (87 vs. 90) and reading achievement (2.39 vs. 2.74).

Descriptive statistics and tests of significance between the perceptual dominance groups on CA, IQ, reading achievement, and perception test scores appear in Table 2. Inspection of Table 2 indicates that the two groups did not differ significantly on mean reading grade equivalent scores of the Metropolitan

Table 2

Descriptive Statistics for the Perceptual Dominance Groups

Measure	Visually Dominant (N = 20) X	Visually Dominant (N = 20) s	Auditorily Dominant (N = 20) X	Auditorily Dominant (N = 20) s	t	$t_{.95}$
Reading Average[a]	2.30	.75	2.49	.57	.90	2.02
Stanford-Binet IQ	86.50	10.01	88.50	7.77	.71	2.02
Chronological Age[b]	102.55	4.61	104.30	6.28	1.03	2.02
Auditory Test Sum[c]	259.45	39.40	323.10	22.08	6.30*	2.02
Visual Test Sum[d]	313.45	38.50	273.80	25.04	3.86*	2.02

[a]Average grade equivalent of the three reading subtests of the Metropolitan Achievement Test.

[b]In months.

[c]Sum of transformed standard scores for the six auditory perception tests.

[d]Sum of transformed standard scores for the six visual perception tests.

*$p < .001$.

Achievement Tests, Stanford-Binet IQ, or CA. As anticipated, Table 2 indicates that both groups were significantly inferior on the perception test performance in their weak sense modality. Moreover, the visual dominance subjects were significantly superior to those in the auditory group on visual perception test scores ($p < .001$), while the auditory dominance subjects obtained significantly higher auditory perception test scores ($p < .001$).

Instructional Program

Each subject was taught to recognize 15 unknown words by a visual or sight-word teaching procedure, and 15 unknown words by an auditory or phonic method. The teaching procedures were taken primarily from the Mills Learning Methods Test (Mills, 1964). The Mills Test consists of four sets of 2 x 4 inch picture-wood cards (nouns)--one set each for the primer, first, second, and third grade reading levels. Ordinarily the words within only one grade level are administered to the child in order to identify a specified number of unknown words. The child is then taught to recognize a subset of these words according to four different standardized teaching approaches.

As a result of a pilot study and extensive field testing, two alterations were made in the standardized procedures of the Mills Test. The first alteration involved increasing the number of test words for each method from 10 to 15 words. This change was felt to be necessary in order to avoid possible ceiling effects on the learning task. A second change included the deletion of certain steps from the Auditory and Visual Methods so that the final teaching procedures for the two methods each included five different steps.

Under the visual teaching method, each subject was taught to recognize 15 unknown words according to procedures which stressed exclusively visual clues. The visual clues emphasized association of the word with a picture, with configurational outline of the word, and with other visual characteristics such as length, etc. In the auditory method, subjects were taught to recognize a set of 15 unknown words according to teaching procedures which stressed the phonetic qualities of each word. Teaching procedures in the auditory method attempted to teach the sounds of the individual letters, as well as blending individual sounds into a whole word. After it was discovered that a few children in the pilot sample failed to miss a minimum of 30 words, a third procedural change was made to increase the difficulty of the pretest by adding a number of words (nouns) from the Thorndike and Lorge 30,000 Word List (Thorndike & Lorge, 1944).

Two female instructors were trained to administer the modified Mills Learning Methods Test. Both instructors had some experience in teaching as well as in the administration of psychometric tests. Instructors saw each subject for a total of three or four sessions. On the first session, a pretest was administered to each subject in order to identify between 30 and 40 unknown words out of a possible total of 205 words. The unknown words were then shuffled and a minimum of 15 to 20 words were assigned randomly to each of the two teaching approaches. Subjects were taught to recognize each list in a 23 minute lesson, spending one-and-one-half minutes on each word. Following the teaching lessons, the amount of learning was assessed by the administration of an immediate recall test. The second session took place one week later when a measure of delayed recall was secured

by testing again the ability of each pupil to read aloud the same list of 15 study words. Following the recall test, the second list of 15 words was taught to the child using the remaining teaching procedures. (In a few instances, it was impossible to administer the second teaching lesson immediately following the administration of the delayed recall measure. Thus, it was necessary in these cases to administer the second teaching lesson within a few days of the recall test.) The amount of learning for the second teaching session was also assessed by the administration of both an immediate and delayed recall test over the study words. On both of the tests, the 15 study words were administered in random order among 20 distractors randomly selected from the words on the revised Mills test list. The learning criteria consisted of the number of study words recognized correctly on the immediate and delayed recall tests under each teaching method.

The order of the teaching methods was randomized across subjects with the restriction that both orders were represented equally within each perceptual dominance group (i.e., A-V and V-A). Whenever it is feasible, the instructors were assigned randomly to schools with the restriction that they had to teach the same number of subjects within each order of presentation and teaching method combination.

Results[2]

Statistical analyses on the immediate and delayed recall scores were conducted by a mixed extended Lindquist type IV (Lindquist, 1953) analysis of variance (perceptual dominance x length of retention x teaching method x order of teaching presentation). Means and standard deviations on Mills Test scores for the perceptual dominance

groups appear in Table 3. Descriptive statistics for the immediate and delayed recall measures and the methods of teaching for the total group of 40 subjects appear in Table 4.

The analysis of variance on Mills Test scores for the auditory and visual perceptual dominance groups is in Table 5. Examination of Table 5 indicates the presence of a significant effect only for length of retention. The mean performance scores for the immediate recall test were significantly higher than those obtained on the one-week delayed recall test ($p < .001$). The other comparisons involving perceptual dominance groups, methods of teaching, and order of teaching presentation failed to reach statistical significance. The mean difference between the auditory and visual methods, however, approached statistical significance ($p = .06$). Table 4 reveals that the visual method of teaching resulted in higher performance scores over both retention intervals. Contrary to prediction, the interaction between perceptual dominance and methods of teaching did not reach statistical significance. Finally, none of the other interactions involving the attributes of perceptual dominance, methods of teaching, length of retention interval, or order of presentation attained statistical significance.

Supplementary Analyses

Post hoc analyses were conducted on the Mills Test scores of the 10 auditory and 10 visual dominance subjects with more extreme differences in auditory and visual perception test scores. In this analysis, the attributes of order of presentation and length of retention interval were ignored. (However, the perceptual dominance groups did contain the same proportion of subjects in each of the

Table 3

Descriptive Statistics on Mills Test Scores

for the Perceptual Dominance Groups

Source	Visually Dominant (N = 20) $\bar{X}$	Visually Dominant (N = 20) s	Auditorily Dominant (N = 20) $\bar{X}$	Auditorily Dominant (N = 20) s	Mean Difference
Visual Method					
Immediate Recall[a]	7.10	5.17	9.00	4.60	-1.90
Delayed Recall[b]	5.65	5.59	7.95	4.70	-2.30
Total	6.38	5.25	8.48	4.57	-2.10
Auditory Method					
Immediate Recall[a]	6.65	5.29	8.30	4.31	-1.65
Delayed Recall[b]	5.50	4.88	7.25	4.44	-1.75
Total	6.08	5.02	7.78	4.27	-1.70
Totals	6.22	5.18	8.12	4.47	-1.90

[a]Recognition of unknown words immediately following instruction.

[b]Recognition of unknown words exactly one week after instruction.

Table 4

Descriptive Statistics for Retention Intervals and Methods of Teaching

Source	N	$\overline{X}$	s
Immediate Recall[a]	40	7.76	4.86
Delayed Recall[a]	40	6.59	4.94
Visual Method[b]	40	7.42	4.97
Auditory Method[b]	40	6.93	4.68

[a]Computed over both methods of teaching.

[b]Computed over both retention intervals.

Table 5

Analyses of Variance on Mills Test Scores for the Perceptual Dominance Groups

Source	N	ss	ms	F	$F_{.95}$
Between Subjects	39	3457.600			
Perceptual Dominance(A)	1	144.400	144.400	1.58	4.11
CD	1	15.625	15.625	.17	4.11
ACD	1	15.625	15.625	.17	4.11
Error(b)	36	3281.950	91.165		
Within Subjects	120	389.500			
Retention(B)	1	55.225	55.225	18.86*	3.94
Method(C)	1	10.000	10.000	3.42	3.94
Order(D)	1	0.900	0.900	.31	3.94
AB	1	1.600	1.600	.55	3.94
AC	1	0.625	0.625	.21	3.94
AD	1	1.600	1.600	.55	3.94
BC	1	0.225	0.225	.08	3.94
BD	1	0.000	0.000	.00	3.94
ABC	1	0.225	0.225	.08	3.94
ABD	1	1.600	1.600	.55	3.94
BCD	1	1.225	1.225	.42	3.94
ABCD	1	0.025	0.025	.01	3.94
Error(w)	108	316.250	2.928		
Total	159	3487.100			

*$p < .001$

two orders of presentation.)

Table 6 contains a two-way analysis of variance (perceptual dominance x teaching method) on Mills Test scores for the two groups with more extreme differences in perception test scores. The analysis again confirmed the earlier one in that no significant difference in performance was obtained between the two perceptual dominance groups, and the interaction between perceptual dominance and methods of teaching was not significant. However, the auditory and visual dominance subjects combined had significantly higher scores under the visual method of teaching, in contrast to those obtained under the approach with an auditory or phonic emphasis ($p < .01$). (The descriptive statistics on the more extreme dominance subjects appear in Table 7.)

Discussion

The results of the present study failed to support the prediction that teaching methods consistent with the auditory and visual perceptual strengths of disadvantaged boys would facilitate their learning to recognize and retain a list of unknown words. It appears that the subjects learned to recognize unknown words equally well under teaching procedures which matched either their perceptual strength or weakness. Failure to obtain an interaction between perceptual dominance and teaching approaches was consistent with the results of previous studies by Bateman (1967), Harris (1965), and Robinson (1968). Accordingly, extant evidence suggests that reading methods which teach to the perceptual strengths or weaknesses of children neither facilitate nor deter the development of word recognition skills.

Table 6

Analysis of Variance on Mills Test Scores

for the More Extreme Perceptual Dominance Groups

Source	SS	df	MS	F
Between Subjects	4131.90	19		
Perceptual Dominance(A)	160.00	1	160.00	.72
Error(B)	3971.90	18	220.66	
Within Subjects	206.00	20		
Method(B)	73.15	1	73.15	9.92*
AB	.15	1	.15	.02
Error(W)	132.70	18	7.37	
Total	4337.9	39		

*$p < .01$

Table 7

Descriptive Statistics on Mills Test Scores

for the More Extreme Perceptual Dominance Groups

Source	N	$\bar{X}$	s
Visually Dominant			
Visual Method	10	5.85[a]	6.03
Auditory Method	10	4.60	5.02
Total (Mills)	10	5.22	5.48
IQ	10	86.10	9.72
Reading	10	2.23	.84
Auditorily Dominant			
Visual Method	10	7.95	5.38
Auditory Method	10	6.50	4.84
Total (Mills)	10	7.22	5.01
IQ	10	87.20	8.36
Reading	10	2.39	.60
Totals			
Visual Method	20	6.90	5.66
Auditory Method	20	5.55	4.90

[a]Mean correct recognition score on the immediate and delayed recall tests (total possible = 15).

Contrary to prediction, perceptual dominance groups in both the primary and supplementary analyses demonstrated greater learning under the visual teaching approach employing a greater emphasis. Evidence of superior performance under this approach was obtained principally in the supplementary analysis on subjects with more extreme differences in auditory and visual perception scores; the difference between the two teaching methods in the primary analysis only approached statistical significance ($p = .06$). In an attempt to account for the seemingly inconsistent results between the two analyses, additional comparisons were made between the more extreme perceptual dominance group and those subjects with less discrepant perceptual scores on IQ, reading achievement, and socioeconomic status. While the two groups were comparable on IQ and reading ability, subjects with more extreme perception test scores were rated significantly lower on educational level of the better educated parent (10.35 vs. 11.42 grades; $p < .05$). No significant differences were obtained between groups in income level or quality of housing, however. Since educational level is probably a more sensitive index of socio-economic status for this sample, subjects in the more extreme perceptual dominance groups may have been more educationally disadvantaged. It is possible that subtle effects of experience (i.e., amount of environmental enrichment) were more important than perceptual abilities in influencing performance under the two methods of instruction. However, the findings may merely represent a statistical artifact attributable either to the non-normal distribution of criterion scores, or to the use of multiple analyses on the same subjects, or to the fact that the pretest measure required the subjects to recognize

the words visually, possibly resulting in the selection of words with greater visual than auditory stimulus salience.

Superior performance under the visual teaching approach is particularly noteworthy, however, considering the subjects had been exposed to systematic training in phonics during the first and second grades. These results are congruent, however, with the findings of recent studies dealing with the perceptual and learning characteristics of disadvantaged children. On a serial learning task, Katz and Deutsch (1964) found a visual presentation superior to both an auditory and an alternating auditory-visual presentation for disadvantaged Negro boys. Hill and Hecker (1966) found no significant differences in learning performance under auditory and visual modes of presentation with a group composed largely of middle-class children. The findings of these studies are buttressed by an increasing accumulation of evidence indicating the existence of pronounced auditory perception deficits among disadvantaged children (Buktenica, 1966; Clark & Richards, 1966; Deutsch, 1964; McConnell & Robertson, 1967; Templin, 1957). It appears that the weight of reported evidence suggests that the disadvantaged learn more efficiently when verbal material is presented visually. Development of visual strengths among disadvantaged children probably evolves from long-term exposure to an environmental milieu in which the signal-to-noise ratio is nearly equal (Deutsch, 1964). Excessive background noise of many lower class homes perhaps encourages an orientation toward developing structure and order through concentration upon visual experiences.

Implications for Research

Although the present study instituted improvements in methodology over similar studies, nevertheless it was subject to a number of limitations. First, the subjects may have possessed confirmed reading habits after three years of school experience which outweighed perceptual characteristics in determining performance on the curriculum task. Past reading experience, moreover, undoubtedly reduced original auditory and visual perceptual differences among subjects, thereby obfuscating any potential relationship between methods of teaching and sense modality dominance. Secondly, sampling procedures composed groups on the basis of discrepancies in composite auditory and visual perceptual scores. The selection criteria might have been made more stringent by requiring consistent superiority on tests reflecting modality strength and inferiority on those indicative of perceptual weakness. Thirdly, correlations between these auditory and visual perceptual tests and reading achievement were low to moderate in magnitude (Bruininks, 1969). The perception test with the highest correlation accounted for only 21% of the differences in reading performance. It appears that the influence of auditory and visual perceptual abilities upon the development of reading skills at the upper primary grade level may not be of sufficient importance to predict the learning of unknown words under varying methods of presentation. Fourthly, the instructional program was found to be too short for some subjects. Inspection of the immediate and delayed recall scores revealed a sizeable proportion of the subjects attained either very high or very low scores in both methods of teaching. Finally, the present study was based upon the premise that auditory and visual

perceptual skills are general ability areas. It is possible, however, that the organization of abilities represented by the measures employed in this study bears little relationship to whether the tests are presented auditorily or visually. Thus, children might have deficiencies in the ability to discriminate likenesses and differences, irrespective of the sensory mode of presentation. The foregoing methodological considerations suggest the need to examine further the efficacy of matching teaching procedures to the perceptual aptitudes of children among nonreading disadvantaged pupils at the kindergarten and first grade levels.

In recent years, the diagnostic model of teaching has been recommended as an antidote for the amelioration of learning difficulties (Kirk & Bateman, 1962). The validity of the clinical teaching model rests upon the questionable premise that the diagnostic devices possess demonstrated validity, fundamental changes in reading performance will seldom accompany the remediation of deficit areas of functioning. Well controlled investigations are urgently needed to assess the value of clinical teaching approaches to remedy learning difficulties. Parallel efforts to develop specific diagnostic aptitude tests related to early reading performance should also be encouraged.

Future research should also endeavor to determine the effects of differential environmental background upon the development of the linguistic abilities, perceptual abilities, and reading performance of disadvantaged children. Moreover, efforts to eradicate perceptual and linguistic deficits of the disadvantaged through systematic training should receive focus in evaluation research studies in early

education as should observation of the effects of such training upon the development of early reading skills. The validity of "deficit" models of teaching disadvantaged children, however, is being questioned by a number of scholars in the field of linguistics. Arguments against "deficit" oriented approaches of teaching reading to disadvantaged pupils have been articulated most cogently by Baratz and a number of her associates at the Center for Applied Linguistics (cf. Baratz, 1970; Baratz & Shuy, 1969). According to Baratz, failures in many inner-city schools lie not in cognitive deficiencies of the child, but rather in the present methods and materials employed to teach reading. Primarily, it is felt that confusion in learning to read among many black disadvantaged children results from the incongruence between the language patterns (e.g., dialect) of their teacher and their own patterns. Use of dialect based-materials is recommended to enable inner-city children to read material with which he is already familiar (Baratz, 1970). Whether the reading abilities of disadvantaged children are better enhanced through the use of dialect-based reading materials or by extensive readiness training, or both, is an issue that can only be resolved by further investigation. Through judicious selection and sequencing of reading experiences and/or ameliorative training in deficit areas of behavioral functioning, reading failure should decrease among the "one in three" who comprise the educationally disadvantaged.

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[2]The original study included extensive supplementary analyses of the nature and extent of relationships between the perceptual tests and a measure of reading achievement. The results of these analyses appear in Perceptual and Motor Skills, 1969, 29, 179-186.